Final Examination 2013-2014

Note: 5 Questions only

Q1a: From the gravitational law calculate the weight W (gravitational force with respect to the earth) of an 80-kg man in a spacecraft traveling in a circular orbit 250 km above the earth’s surface. Express W in both Newton’s and pounds. Mass of earth \((5.976 \times 10^{24})\) kg and diameter of earth \((12742 \times 10^3)\) km \(G(6.673 \times 10^{-11} \text{m}^3/\text{kg.s}^2)\).

(6 Mark)

Q1 b: Determine the reactions at \(A\) and \(B\) for the beam subjected to the distributed and concentrated loads.

(14 Mark)

Q2: Compute the force in each member of the loaded cantilever truss by the method of joints.

(20 Mark)

Q3: The vertical position of the 100-kg block and-activated wedge. Calculate the force must be applied to raise the block. The coefficient of friction for all mating surfaces of the block and wedge is 0.40.

(20 Mark)

Q 4 a: Determine the height above the base of the centroid of the cross-sectional area of the beam.

(6 Mark)
Q 4 b: Gear C drives the V-belt pulley D at a constant speed. For the belt tensions shown calculate the gear-tooth force $P$ and the magnitudes of the total forces supported by the bearings at $A$ and $B$.

(14 Mark)

Q5: Let's use all properties learned on this page to now determine the mass of the monkey. In the process, also calculate $T_1$, $T_2$, $T_3$, $T_4$, $T_5$, $T_6$, and $W_2$ IF $W_1$ equals 350N.

(20 Mark)

Q 6 a: The motor mounted on the bracket is acted on by its 160-N weight, and its shaft resists the 120-N thrust and 25 N.m couple applied to it. Determine the resultant of the force system shown in terms of a force $R$ at $A$ and a couple $M$.

(12 Mark)

Q 6 b: The cross section shown is for a complete cast-iron body of revolution about the $z$-axis. Compute its mass $m$. Density of cast-iron 7500 kg/m$^3$.

(8 Mark)

Examiner

Good luck